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Effects of a forest resource education program on Grade 6 students

H.F. Merchant and J.J. Williams

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Petawawa National Research Institute

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EFFECTS OF A FOREST RESOURCE EDUCATION PROGRAM ON GRADE 6 STUDENTS

Information Report PI-X-54

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ABSTRACT

The effects of the Petawawa Resource Education Program (PREP) in altering children's knowledge about attitudes toward forest resources were investigated. The study was concerned with determining the effect of participation in the program, the effect of field trips, the effectiveness of the sixth year of the program, and with determining the reaction of teachers to the program. Four comparison groups of Grade 6 students were utilized in the evaluation. Student subjects completed both a Knowledge Assessment Test and an Attitude Survey. Teachers completed a Questionnaire and an Attitude Survey. All tests used in the evaluation were designed by the investigator.

RÉSUMÉ

Les auteurs étudient les effets du Programme de sensibilisation aux ressources de Petawawa en ce qu'il a modifié les connaissances et attitudes des enfants à l'égard des ressources forestières. Ils se sont attachés à préciser l'effet de la participation au programme et des randonnées sur le terrain et évalué l'efficacité du programme de la sixième année et les réactions des enseignants. L'évaluation a porté sur quatre groupes d'élèves de sixième année. Ils ont subi un test d'évaluation des connaissances et répondu à un questionnaire sur leurs attitudes. Les enseignants ont répondu à un questionnaire et à un sondage d'attitude. Les tests de l'évaluation ont tous été conçus par l'enquêteur.

EFFECTS OF A FOREST RESOURCE EDUCATION PROGRAM ON GRADE SIX STUDENTS

INTRODUCTION

A Public Awareness program was developed at PNFI (then Petawawa Forest Experiment Station) in 1972. The Station believed that a public which was informed about forest ecology and the benefits of proper forest management would be better equipped to react intelligently to resource use and management issues (Davies 1984).

This idea was carried one step further through the development of the Petawawa Resource Education Program (PREP), the focus of this study. PREP is based on the principle that children, who experience the forest environment as an integral part of their learning processes, will grow to respect the forest and be both concerned and informed when faced with resource management issues (Davies 1984).

The program

The resource education program is offered in conjunction with the Renfrew County Board of Education (R.C.B.E.) for Grades 1 through 10. The program is based on curriculum units developed by R.C.B.E. consultants and teachers. The purpose of the curriculum is to promote better management of Canada's forest resource by providing facilities and activities that enable teachers to use the forest as a teaching tool (PNFI 1982). The curriculum emphasizes increasing children's knowledge of forest resources, and demonstrating improved forest management techniques.

For each of Grades 1 through 10 (except Grade 8), a cold weather unit and a warm weather unit are available. The units include activities and exercises which are completed in the classroom before and following the field trip to the Institute. Classes arrive at the Institute in mid-morning and spend time before and after lunch on their particular unit of study. The base for this program is provided by a PNFI resource person and the Institute's resources which include a diversity of forest types, a wide range of forest research and management experiments, a fire hall, weather station, auditorium, and a wide range of forestry equipment.

A search of the literature revealed few studies of programs similar to PREP. Because the program simultaneously combines several techniques commonly used in Environmental Education, PREP is unique. Special features of the program include the following:

1) has a largely teacher-developed and classroom-oriented curriculum;

2) is an ongoing program which builds on itself from Grade 1 through Grade 6;

3) has field trips utilizing a forest resource facility, and avails of local forest environments and forest management situations;

4) comprises pre- and post-field trip activities; and

5) is a focus on both cognitive and attitudinal changes in children.

OBJECTIVES

The major foci of this investigation were to determine if participation in a forest resources education program (PREP) over a period of six years caused a significant change in: 1) students' knowledge about forest resources and management; and 2) students' attitudes toward forest resources and management. An additional purpose of the study was to document teachers' responses and attitudes toward the program. To achieve these objectives a series of questions falling into four categories was posed. These questions were concerned with: 1) determining the effect of participation in the program; 2) determining the effect of the field trip; 3) determining the effect of the sixth year of the program; and, 4) determining the reaction of teachers to the program.

METHODS AND PROCEDURES

The subjects of this investigation were 1047 Grade 6 students representing 23 schools from the R.C.B.E. system and seven schools from the Renfrew County Roman Catholic Separate Schools system. There were also 119 Grade 1 through 6 teachers representing R.C.B.E. schools with complete or partial program participation. The Separate Schools served as a control group and were selected by a panel composed of PREP personnel and the superintendents and principals from both school systems. The sample selected was judged to be a representative cross-section of the entire Separate School system and was considered equivalent to the R.C.B.E. school sample in intelligence and socio-economic factors.

Schools were assigned to one of four comparison groups according to their degree of participation in PREP. Group A (N=19 classes) participated in pre- and post-visit classroom activities and a Grade 6 field trip to PNFI. Group B (N=3 classes) had participated in pre- and post-visit activities and a field trip to PNFI through Grade 5. Group C (N=8 classes) was designated as the control group, and had neither participated in nor been exposed to PREP. Group D (N=8 classes) participated in the pre- and post visit curriculum activities without experiencing the field trip.

The students were evaluated using two instruments: a Forest Resources Knowledge Assessment Test (Appendix A) and a Forest Resources Attitude Survey (Appendix B). These tests were developed by H.F.M. in consultation with the R.C.B.E. Curriculum Consultant and the Canadian Forestry Service personnel responsible for overseeing PREP. The overall content of the program was broken into four general areas of emphasis for the Knowledge Assessment Test

and five areas of emphasis for the Attitude Survey. Questions were written for each of these categories based on the information found in PREP Resource Booklets and program objectives.

In its final form, the Forest Resources Knowledge Assessment Test consisted of 40 questions of the "objective" format. The Forest Resources Attitude Survey in its final form consisted of 40 statements to which the subjects responded: strongly agree, agree, undecided, disagree, or strongly disagree.

Reliability of the two instruments was determined by the test-retest method. Two R.C.B.E. schools and one Separate school were used for this procedure. One week passed between the first and second administrations of the tests, with no instruction given on forestry concepts. Analysis using Cronbach's Alpha revealed a reliability coefficient of .693 for the Knowledge Test and .742 for the Attitude Survey.

Teachers' attitudes towards PREP were assessed by means of a questionnaire and attitude survey. In developing these instruments, input was sought from the R.C.B.E. Curriculum Consultant, R.C.B.E. Superintendent, and the PREP director. Based on their input, and personal study and observation, five categories were selected for the assessment of teacher attitudes toward PREP. The Teacher Attitude Survey was composed of statements to which the subjects responded on a Likert-like scale consisting of five categories. A simple checklist type of questionnaire sought general information from teachers regarding such things as frequency of PREP field trips, areas of needed revision in Resource Booklets, and preferred units and topics.

Test administration and data collection were conducted by the Grade 6 teachers in each school. School principals and the PREP director oversaw the distribution, collection, and return of these tests. Tests were administered over a two-day period in late October 1983. Students completed one test per sitting each day. Both the teacher survey and questionnaire were administered by school principals at their individual school staff meetings held in late October 1983.

Analysis of the data was completed using the Statistical Package for the Social Sciences (SPSS). In scoring the Knowledge Assessment tests, correct responses were given a value of one. Individual scores on this test, then, represented the number of items each student answered correctly with a possible range of 0 to 40. In scoring the Attitude Survey, a value of one was given for a "strongly agree" response progressing upward to a value of five for a "strongly disagree" response. Scores for the Attitude Survey could range from 40 to 200. Mean scores of schools and groups were used in statistical comparisons for both the Attitude and Knowledge measures.

One-way analysis of variance was used to analyze the scores obtained on both student test measures. If significant F ratios resulted, t-tests were used to compare scores on the two test measures for significant group mean differences. Comparisons were made between mean scores of Groups A and C, Groups A and D, and Groups A and B. Teachers' (Group E) scores were also analyzed and correlated with mean student scores from the corresponding

schools. Pearson Product-Moment correlations were calculated to determine relationship between related survey and test variables. An alpha of 0.05 was set for all statistical tests.

RESULTS AND DISCUSSION

Student Test Results

The average age of the subjects was 11 years with a range from 10 to 14 years. Approximately 82% of the subjects had consistent exposure to PREP in Grades 1 through 6. The mean number of visits to the Forestry Institute recalled by students was four, although as many as 11 visits were possible. Student test results are summarized in Tables 1-5.

There was a significant (P=.05) difference between groups on Knowledge (F=2.94) and Attitude (F=3.30) scores.

Comparisons were made between the mean scores of Subgroup A and Group C to determine the effect of program participation. Results revealed a significant difference between the two groups on both Attitude and Knowledge test scores (Table 2). Group A held both a higher Knowledge score and the more positive attitude. There were no significant differences in Attitude or Knowledge test scores between Groups A and D. Also, there were no significant differences between Groups A and B with respect to Knowledge scores. Group A, however, had a significantly more positive Attitude score.

Results of these tests indicated that students who participated in PREP exhibited more positive attitudes towards the forest ecosystem and forest management than those who did not participate. PREP participants also scored significantly higher than the control group in their knowledge of forestry concepts. Results of the Group A and D comparison indicated that participation in classroom studies and activities had as much or more impact on participants than the field trips to the Forestry Institute. It would seem that the field trip either: 1) was composed of learning strategies and activities which did not influence attitude or knowledge achievement; 2) impacted students in ways not measured by the test instruments; or 3) was influenced by negative factors which interfered with learning.

The lack of a significant difference between Groups A and D on Knowledge scores, could be attributed to the test itself. The content of information covered during field trips was not well documented in the Resource Booklets. Since test items were constructed based on information in the booklets, it is possible that field trip concepts were not adequately covered by the test.

Results of the comparison of mean scores of Groups A and B indicated that the one visit in the fall of the sixth year did not significantly impact students in their knowledge achievement regarding forest resources. It did seem to impact their attitudes, however. The positive attitudes of these students may have been strengthened since their Grade 5 visit due to other unknown factors and events they experienced. The teaching approach of the sixth grade fall lesson should also be considered. The methods and accompanying field trip activities may have been more affectively oriented than other lessons, and exerted positive influence on student attitudes. Any conclusions drawn from the comparison of Groups A and B should be made

cautiously, however, as the sample sizes of the groups were unequal, making accurate analysis difficult.

Additional questions posed by this study were examined by Pearson Product-Moment Correlations and t-tests to determine relationships between interacting variables. Results indicated that little relationship existed between the number of visits made to the Forestry Institute by students and their Knowledge scores, and that no relationship was apparent between number of visits and Attitude scores. A t-test was computed to determine if teachers' participation affected student scores and the number of visits made. Results revealed that the participation status of the teacher did not significantly affect Knowledge and Attitude scores of students. Teacher participation did, however, have a significant effect on the number of visits made to the Forestry Institute. Additional correlations calculated to determine the effect on Attitude and Knowledge scores of the number of visits made revealed either no relationship or very poor relationships for both the participating and non-participating teachers' students. When correlations were computed for this relationship by individual schools, however, eight schools or 42% of the 19 valid school cases showed significant correlations between either Knowledge or Attitude scores and number of visits. Results are summarized in Table 3.

Possible reasons for the negative correlations might include: 1) students were bored with the visits or experienced "overkill" on concepts and ideas presented; 2) the period of time (approximately 1½ to 3 hours) devoted to learning activities during the visits was not adequate; or 3) the lessons as presented were inappropriate for the learning levels and needs of the students from these three schools. Positive correlations may have been due to a well-prepared and enthusiastic teacher, increased personal attention due to small group size, and lessons at an appropriate level.

As the results summarized in Table 3 indicate, no school in this study showed highly significant correlations between number of visits and both Knowledge and Attitude scores. The results in Table 3 indicate that the frequency of visits to the Forestry Institute primarily impacted students' knowledge about forest resources. The results did not indicate that increases in knowledge were also accompanied by improvements in attitude.

The results of these analyses are supported by Kostka (1978) who found that an environmental education program consisting of one visit to a nature centre per year and related school activities had little impact on the environmental attitudes of sixth graders. Burrus-Bammel (1978) also found that there was no significant relationship between knowledge and attitude in a three-year study of a Forest Industries Environmental Education Camp.

Teacher test results

A Teacher Questionnaire (Appendix C) was used to assess teachers' responses to the Resource Booklets and program organization. It also sought to identify weaknesses of the program and solicited suggestions for improvement. The Teacher Survey (Appendix D) was utilized to measure teachers' feelings and attitudes towards PREP and focused on the field trip, motivation for participating, importance of the Resource person, appropriateness of the learning activities, and the purpose of PREP.

Teachers from all R.C.B.E. schools containing Grades 1 through 6 were asked to respond to the two questionnaires. Teachers were classified into two categories. Participating (P) teachers were those who were involved in teaching pre- and post-field trip concepts and activities, and who accompanied their students on the field trips. Non-participating (NP) teachers were those who either were not involved with PREP in any way, or who did not take their students on field trips, although they might have taught PREP concepts in their classrooms. One hundred and nineteen teachers representing 21 schools responded to both the Questionnaire and Survey. Twenty respondents were NP teachers and 99 were P teachers. Because all Surveys were not filled out completely, the NP sample size for that measure was reduced to six teachers. The P sample size for the Survey was 83.

Results from the Teacher Questionnaire are as follows:

Participating Teachers. Sixty-five per cent of these respondents had visited the Forestry Institute with their students more than five times, while 26% had visited two to five times and 7% had visited only once. Fifty-eight per cent of the respondents generally made a visit once per year with their students while 42% went twice per year. Eighty-nine per cent of these teachers felt the time spent at the Institue was adequate. Three per cent indicated the time was inadequate, and 3% called it excessive. Table 1 summarizes responses to the question regarding areas of the Resource Booklets needing improvement. Sixty-two per cent of these respondents found the booklets very useful while 36% found them moderately useful, referring to them but designing many of their own activities.

Non-Participating Teachers. Forty-five per cent of these respondents had never visited the Forestry Institute with their students, 30% had visited it two to five times while 20% had visited once. Eighty-five per cent of the respondents made zero visits per year with their students and 15% visited once per year. Some of these NP teachers may have visited PNFI while teaching at another school, or in the early years of PREP when all schools really made an effort to participate. These figures indicate that there is a definite trend towards non-involvement with PREP in parts of the R.C.B.E. school system.

Thirty per cent felt the time spent at the Institute was adequate and 25% found it inadequate. Sixty-five per cent of the teachers found the booklets moderately useful, and referred to them but designed many of their own activities. Thirty per cent stated they were not very useful and had rarely or never used them. Five per cent found them very useful and had used them often.

A comparison of the most frequent suggestions for improvement identified by both groups of teachers led to the following implications: 1) Teachers from both groups are interested in and committed to the purpose and concepts of PREP, and desire to implement related or alternative ideas and activities on their own school sites if the visit to the Forestry Institute is not possible; 2) Teachers need more background information about the concepts to ensure quality teaching for their students; 3) Students need to be more involved in a greater variety of activities during the field trip; 4) There is potential and interest in offering a wider variety of study topics for field trips to the Forestry Institute; 5) There is a need to address contemporary issues in forest management through the development of ideas for

problem-solving, critical thinking, and simulations; and, 6) Teachers felt that the program is adequate and acceptable in its present form, but action on suggested revisions would make it more effective.

PREP teacher survey results

Table 5 shows the results of the PREP Teacher Survey. The NP teacher sample of 6 valid cases is very small, making valid comparisons difficult. Results are stated cautiously. A five point Likert-like scale was used in which "one" corresponded to strongly agree with the figures progressing upward to "five" which corresponded to strongly disagree. The range of possible scores was 45 to 225.

Results indicated that P teachers had more positive feelings towards the program than NP teachers. Participating teachers' scores were aligned closely to the "agree" point on the Likert-like scale while NP teachers' scores clustered towards the "undecided" category. The difference between the scores of the two groups was significant (P=0.50).

The PREP Teacher Survey focused on assessing teachers' responses toward several specific program components. In regard to the value of the "Resource Person", results indicated that teachers from both groups perceived the role of the Resource Person as important, necessary, and effective. The personality of this individual seemed quite important to the teachers as well. This is probably because the person works with students, teachers, and administrators and needs the skills and knowledge to communicate effectively in all three situations.

Concerning teachers' understanding of the purpose of PREP, results showed that participating teachers felt they had a good understanding of the purposes of PREP and its curriculum. It was interesting, however, that P teacher feelings were so divided regarding PREP's purpose of increasing the public demand for good forest management. That concept is one of the major objectives of PREP as stated by the Canadian Forestry Service, and yet teachers do not seem to feel strongly about it. Perhaps they really do not understand the major purpose of the program. Results for the NP group on these statements indicated uncertainty and confusion about PREP's purpose. This may be due to lack of exposure and familiarity with the program.

Another area of interest in the Teacher Survey was that of teachers' motives for participating. The majority of the P group indicated their motives for involvement were centered around the needs of students, i.e. the knowledge their students would gain and the importance of their learning about Canadian forest resources. These teachers also indicated that their reason for participating was not due primarily to their own interest in forestry and the outdoors. They stated, however, that they would continue to participate in PREP even if it were not required. The majority of NP responses indicated they were undecided about their motives and feelings towards the required participation. They agreed, however, that it was important for students to learn about Canadian forest resources.

Teachers' feelings towards field trips and their effectiveness were also examined. The results suggested that P teachers felt the field trips to the Forestry Institute motivated themselves and students. Both groups felt that quality pre-trip preparation aided field trip success. P teachers felt that

PREP was not effective without the field trip, while NP teachers felt the program was effective without the field trip. P teachers also felt that the visits motivated students to learn about forest management.

Many statements on the PREP Teacher Survey addressed the issue of teachers' satisfaction with the program. The majority of P teachers responded positively to these items and indicated that the booklets met their needs, required little adaptation, lessons were easy to present and challenging for students, ideas were clearly stated, and there were many good ideas for integrating forestry concepts into other curriculum areas. These teachers indicated they felt adequately prepared to transmit the information to their students, were committed to the pre- and post-activities, and were satisfied with the time of year their visit was scheduled.

Responses of the NP teachers implied that there is a need for lessons and activities focused on general forest resource concepts which can be implemented on-site or close to the school, and training of teachers in forest resource concepts and related instructional activities. They also indicated they would like to visit a forest site closer to their school.

CONCLUSIONS

An analysis of the findings in relation to the four major objectives of the study permits the following conclusions.

1. Effect of participation in the program.

   Students who participated in PREP achieved significantly higher knowledge test scores than those students who did not participate. PREP does fulfill a unique and important role in educating children about forest resources. Students who were not exposed to PREP for a period of six years did not acquire through other classroom sources or daily living experiences the same pool of knowledge and information regarding forest resources and management.

   Students who participated also held significantly more positive attitudes than those who did not participate. PREP is fulfilling its task of educating students so they acquire more positive attitudes towards the importance of forest resources and proper management. The program fulfills a role that non-participating students are not experiencing elsewhere.

   Results of the study show that positive attitudes towards forest resources do not automatically accompany knowledge gains. Affective aspects of student learning are probably not strongly emphasized in the program. Students need opportunities to apply and experience the knowledge they have gained if they are to integrate it into their lives in the formation of strong attitudes.

2. Effect of the field trip.

   Students who experienced PREP with the field trip did not achieve significantly higher Knowledge scores or hold more positive attitudes than

those students experiencing PREP without the field trip. Students appear to be learning concepts and facts about forest resources and management primarily through lessons and activities conducted by their classroom teachers at their school site. Equivalent learning between schools seems to occur as a result of teachers' consistent teaching of the PREP lessons suggested in Resource Booklets. Activities conducted during field trips to the Forestry Institute may not be aimed at teaching or influencing student attitudes. The same may be true of classroom activities.

Student test results indicated that knowledge and attitudes had not significantly changed due to participation in the field trip. It appears that the structure, content, and organization of the field trip need to be closely analyzed in order to identify interacting factors which are negatively influencing its learning outcomes.

3. Effect of the sixth year of the program.

Students who had experienced six full years of the program did not score significantly higher on the Knowledge test or hold more positive attitudes than those students who had experienced only five years of PREP. This finding implies that the two weeks of teaching involved in the fall Grade 6 unit, and the accompanying field trip, did not significantly add to the knowledge already acquired by students through previous participation in PREP.

4. Reaction of teachers to the program.

Participating teachers hold significantly more positive attitudes towards PREP than the non-participating teachers. The approach and orientation of these teachers towards the importance of forest resources and their role in teaching these concepts to students may vary. Their attitudes may influence the amount of time they spend in teaching the topic, and the thoroughness and enthusiasm with which they approach it.

No significant relationship exists between the participation status of teachers and the Knowledge and Attitude scores of their students. Participation status of teachers does significantly affect the number of class visits made to the Forestry Institute, with participating teachers making more frequent visits.

Both groups of teachers agreed on three areas of PREP which need change or revision. These are: 1) activities which can be done if the field trip is not possible; 2) reference background information for teachers; 3) ideas for simulation, problem-solving, and critical thinking issues in forest management.

These findings indicate that although the Canadian Forestry Service is accomplishing the objectives it has identified for the Petawawa Resource Education Program, they are not doing so as effectively as they desire. This study has identified some of the areas which need to be acted upon in the future to ensure the continuing quality that both the Canadian Forestry Service and the Renfrew County School Board strive for in their forest resources education program.

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TABLES

Table 1. Group means and variances of scores

Forest Resources Attitude Survey**				Forest Resources Knowledge Assessment Test***			
Group	N	Means	Standard deviation	Group	N	Means	Standard deviation
A	19	83.53	4.93	A	17	22.30	3.00
B	3	89.73	3.68	B	3	20.26	4.98
C	6	87.89	3.10	C	6	18.14	0.89
D	8	83.80	3.25	D	7	21.18	2.39

** Range in mean score is 40-200. The lower the score, the more positive the attitude.

*** Range in mean score is 0-40. The higher the score, the higher the knowledge level.

Table 2. t-Test results between groups on mean scores

Forest Resources Attitude Survey Scores (a)				Forest Resources Knowledge Assessment Test (b)		
Contrast	Group	Mean	t-Value	Group	Mean	t-Value
1	Sub A	84.41	-1.97*	Sub A	22.02	3.10*
	C	87.89		C	18.38	
3	A	83.40	0.39	A	22.30	.88
	D	82.56		D	21.18	
4	A	83.40	-2.17*	A	22.30	1.15
	B	89.72		B	20.26	

* Significant at the 0.05 level.
a The lower the score, the more positive the attitude.
b The higher the score, the higher the knowledge level.

Table 3. Summary of schools showing significant correlations between number of visits and scores on attitude and knowledge tests

School	N	Type of score	Mean no. of visits	Correlation
7	39	K	5.85	-0.345*
20	19	K	4.42	-0.396*
39	10	K	4.60	-0.536*
9	47	K	5.96	0.497*
19	29	K	4.76	0.414*
37	11	A	5.09	-0.616*
15	85	A	5.39	0.215*
38	28	A	0.79	0.353*

* Significant at the 0.05 level.

Table 4. Areas of the resource booklets which need improvement or revision results

Area	% Teacher response		% Total Response N=119
	Particip. N=99	Non-particip. N=20	
Organization	3	0	3
Clearly stated objectives	5	5	5
Reference/background information for teachers	35	30	34
Visual appeal and graphics	14	30	17
Greater variety of concepts and topics covered by the program	12	15	13
Activities which can be done if the field trip is not possible	48	35	46
Ideas for simulation, problem-solving, and critical thinking issues in forest management	18	20	18
Greater variety of pre-trip activities	9	15	10
Greater variety of post-trip activities	10	15	11
Greater variety of field trip activities	24	5	21
No revision is needed	20	30	22

Table 5. Overall mean score results of PREP teacher survey

	N	Mean	Mean on Likert 1 to 5 Scale	S.D.
All teachers	89	105.09	2.34	13.33
Participating teachers	83	103.46	2.30	12.01
Non-participating teachers	6	127.67	2.84	10.05

APPENDICES

APPENDIX A

NAME _____

SCHOOL _____

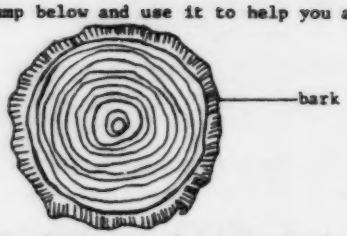
FOREST RESOURCES KNOWLEDGE ASSESSMENT TEST

Directions: This test is designed to find out what you know about forest resources and forest management. Carefully read each question below. Each item has 3 or more answers to choose from. There is only 1 best choice or correct answer for each item. For each question circle the number at the left that matches the answer you have chosen. Circle only one number. Relax, take your time, think hard and do your best job!

* * * \

Study the drawing of the tree stump below and use it to help you answer some of the following questions.

cross-section of a tree stump



7. Rapid growth forming the light colored part of a tree ring is made by the tree in the

   1. spring
   2. summer

1 2 3 3. fall

8. The number of annual rings at the base of the trunk of an old tree is

   1. greater than the number of annual rings halfway up the trunk of the same tree.
   2. less than the number of annual rings halfway up the trunk of the same tree

1 2 3 3. the same as the number of annual rings halfway up the trunk of the same tree.

9. When looking at the rings in a cross section of a tree branch, the current year's growth

   1. will be located just inside the bark
   2. will be located in the center of the branch

1 2 3 3. will be part of the bark

* * * \

11. Compare the borings of Tree A and Tree B. It is true to say that

1. Tree A is younger than Tree B.
2. Tree A is older than Tree B

1 2 3 3. Tree A and Tree B are the same age

12. The best way for a forester to decide whether a tree is ready to cut is to

1. measure how tall it is
2. take an increment boring to find its age and health

1 2 3 3. ask the mill what kind of wood they want

* *

13. Sap is a form of food found

1. in the roots of the tree which flows upward
2. in the trunk of the tree which flows downward

1 2 3 3. in the soil which is absorbed by the tree

14. Most Canadian forest products are made from

1. softwoods
2. hardwoods

1 2 3 3. deciduous trees

15. Conservation means

1. not using products made from natural resources
2. using natural resources of forests, soil, water and wildlife wisely

1 2 3 3. keeping our forest beautiful

16. A large stand of spruce trees in a forest is slowly dying, while all the other kinds of trees remain healthy. The spruce problem is most probably caused by

1. insects or disease
2. the effects of an earlier forest fire

1 2 3 3. a very cold winter

17. The forest is made of layers stacked on top of each other like an apartment building. Which answer names the layers in correct order from the bottom of the forest to the top?

1. herb layer, forest floor, shrub layer, tree canopy
2. forest floor, herb layer, shrub layer, tree canopy

1 2 3 3. forest floor, tree canopy, shrub layer, herb layer

18. When loggers fall trees correctly and then limb and buck them, they practice conservation of forest resources because

1. two loggers usually work together, so fewer trees are cut at one time
2. no wood is wasted
1 2 3 3. wood is harvested with minimum damage to the environment and other trees

19. A stream trickles out from one end of a large pond that contains a stand of dead pine trees. The best explanation for this situation is

1. the melting of heavy snows formed the pond and the trees died naturally as they grew old
2. beavers dammed the stream forming the pond which drowned the trees.
1 2 3 3. insects or disease killed the pine trees which often grow in very wet conditions

20. What signs would best indicate beaver activity in a forest?

1. Some chiseled stumps and partly fallen or cut poplar trees lying on the ground along a streambank
2. Lots of sticks and logs caught in a messy pile in the bend of a very fast river
1 2 3 3. Many animal tracks on the ground and in the mud

21. Most forest fires are caused by

1. Lightning
2. Man
1 2 3 3. I don't know

22. The greatest fire hazard in a forest is

1. slash left on logged areas
2. leaves, twigs, and needles on the forest floor
1 2 3 3. Old dead trees

23. Many people are involved in harvesting trees. Who decides which trees are ready to be cut?

1. a faller
2. a forester
1 2 3 3. a logging foreman

24. Thinning of trees refers to

1. trees that are tall, thin and sickly because they grow close together
2. cutting down some of the trees in a forest so that the remaining trees are evenly spaced
1 2 3 3. cutting the branches off think, bushy trees.

25. A positive result of selection cutting is

1. young trees receive more light in which to grow.
2. habitat for animals which live in the forest canopy is increased.

1 2 3 3. more wood for lumber is produced than by clearcutting.

26. A good forest management practice is to

1. cut down trees with no plans for regeneration.
2. use long term cutting plans to harvest trees when they are mature.

1 2 3 3. cut down seed trees and depend on handplanted nursery seedling for new growth.

* * * \

32. You are the faller at a logging operation. Your job is to

1. choose the safest direction in which to make the trees fall when cut
2. spraypaint a mark on the trees which you will fall
1 2 3 3. decide which trees will make the best lumber

33. In forestry terms the word "landing" means

1. dragging the logs out of the forest
2. place where the logs are piled up
1 2 3 3. loading the logs onto the logging truck

* *

MATCHING DIRECTIONS: Choose the number of the definition from the column at the right which matches the term in the column at the left. Circle that number in the answer column at the left of this sheet.

	Terms	Definitions
1 2 3 4 5	34. Clam	1. machine that makes logging roads through the forest
1 2 3 4 5	35. Choker	2. machine that stacks the logs in the truck
1 2 3 4 5	36. Bulldozer	3. cable that holds logs as they are dragged out of the forest.
1 2 3 4 5	37. Skidder	4. machine that is used in pulling logs out of the forest.
		5. machine that swings and lifts trees off of the ground after they are cut.

* *

38. When harvesting trees the undercut is made on the side of the tree

1. towards which you want it to fall
2. away from where you want it to fall
1 2 3 3. it doesn't matter which side the cut is made on

39. A forester collects seeds from the forest and plants them in a nursery. This is an example of

1. natural regeneration
2. artificial regeneration
1 2 3 3. advanced regeneration

40. You have noticed yellow needles and tiny holes in the bark of trees in a pine stand. Which forest researcher will you call to ask about this situation?

1. One who studies insect and disease problems.
2. One who studies ways to grow new kinds of trees by genetic breeding.
1 2 3 3. One who studies soil and its effect on trees.

APPENDIX B

NAME _____

SCHOOL _____

FOREST RESOURCES ATTITUDE SURVEY

Directions: This survey is asking for your opinions, attitudes or feelings towards forestry ideas. Please read each statement below carefully. Think about what it is saying and then decide if you agree with the statement, disagree with it, or are unsure of how you feel.

Circle the 1 if you strongly agree
Circle the 2 if you agree somewhat
Circle the 3 if you aren't sure how you feel
Circle the 4 if you disagree somewhat
Circle the 5 if you strongly disagree

CIRCLE ONLY ONE NUMBER FOR EACH STATEMENT.

If you are unsure of the meaning of a word, ask your teacher. Remember, we are interested in your honest feelings. Thank you for sharing them.

* *

Strongly Agree	Agree	I'm Not Sure	Disagree	Strongly Disagree	
1	2	3	4	5	1. I always look forward to class visits to the Forestry Institute.
1	2	3	4	5	2. All in all, Canada is taking good care of its forests.
1	2	3	4	5	3. I feel more comfortable in the forest now because of our class visits to the Forestry Institute.
1	2	3	4	5	4. I am bored by all the lessons on trees and forest management.
1	2	3	4	5	5. It is necessary to cut trees.
1	2	3	4	5	6. I have always felt very comfortable in the forest.
1	2	3	4	5	7. The most important use of Canada's forest land is to produce wood products for people to use.
1	2	3	4	5	8. To me the forest just seems like a big group of trees.
1	2	3	4	5	9. The activities we do on our visit to the Forestry Institute are challenging and fun.

Strongly Agree	Agree	I'm Not Sure	Disagree	Strongly Disagree	
1	2	3	4	5	10. Foresters should select exactly which trees are ready to be cut.
1	2	3	4	5	11. I would choose going for a walk in the woods over playing videogames.
1	2	3	4	5	12. I don't enjoy my visits to the Forestry Institute because I am tired and bored from the long bus ride.
1	2	3	4	5	13. Cutting of trees should not be allowed in Canada unless new trees are started as replacements.
1	2	3	4	5	14. I would choose going for a walk in the woods over reading a good book.
1	2	3	4	5	15. The Canadian economy could get along easily without the production and sale of forest products.
1	2	3	4	5	16. Learning about the forest and forest management is very interesting.
1	2	3	4	5	17. Regeneration of trees after cutting is not important.
1	2	3	4	5	18. Being in the forest makes me feel uncomfortable.
1	2	3	4	5	19. It is more important that the forest be used to make products people need than to provide homes for wildlife.
1	2	3	4	5	20. I don't like the forest.
1	2	3	4	5	21. Wherever logging operations occur serious destruction of forest land must be expected.
1	2	3	4	5	22. I like to go exploring in the forest as often as I can.
1	2	3	4	5	23. I think students at all grade levels should learn about forest management.
1	2	3	4	5	24. Protecting and managing Canada's forests is the job of all Canadian citizens.
1	2	3	4	5	25. I get excited when my parents take me on a trip to the forest.
1	2	3	4	5	26. Knowing that once living trees are being destroyed at the sawmill makes me angry.

Strongly Agree	Agree	I'm Not Sure	Disagree	Strongly Disagree	
1	2	3	4	5	27. Only people who are going to work in the forest should have to learn about it.
1	2	3	4	5	28. I believe Canada has a wood supply problem.
1	2	3	4	5	29. I would like to get books about the forest and lumbering.
1	2	3	4	5	30. Man needs trees to survive.
1	2	3	4	5	31. The forest can provide habitat for animals and be a place where wood is harvested at the same time.
1	2	3	4	5	32. I like listening to poems and stories about trees and lumberjacks.
1	2	3	4	5	33. Cutting trees just wastes wood.
1	2	3	4	5	34. There are too many bugs to make the forest enjoyable to visit.
1	2	3	4	5	35. We must harvest our forests.
1	2	3	4	5	36. Insects are only a problem in the forest ecosystem and should be killed.
1	2	3	4	5	37. Learning about forestry is only important in science lessons.
1	2	3	4	5	38. Foresters should first try to regrow trees naturally from existing seeds and trees after cutting a forest.
1	2	3	4	5	39. I think the forest is a beautiful and relaxing place to spend time.
1	2	3	4	5	40. It scares me when we go to the Forestry Institute.

APPENDIX C

Number _____

School Name _____

PETAWAWA RESOURCE EDUCATION PROGRAM TEACHER QUESTIONNAIRE

DIRECTIONS: This form has been designed to aid you in communicating your opinions towards the PREP program with us. Your input is valuable in determining the strengths and weaknesses of this program. Please read the statements and questions below and mark the appropriate response with an "X". Please answer all questions and feel free to make comments or suggestions. Thank you for your cooperation in this evaluation process.

Turn your completed form in to your principal.

* * * *

5. Which resource booklets do you prefer?
   Why?

6. Which unit(s) of the guide do you feel should be replaced or revised?
   Why?

7. Do you have suggestions for other topics you would like to see studied?

8. Please rate the resource booklets in terms of your use of them.

   _____Very useful - I use it alot.

   _____Moderately useful - I refer to it, but have designed alot of my own activities.

   _____ Not very useful - I rarely or never use it.

APPENDIX D

Number _____

School Name _____

PETAWAWA RESOURCE EDUCATION PROGRAM TEACHER SURVEY

DIRECTIONS: This questionnaire is designed to help us gather information about your feelings and reactions to PREP - both its strengths and weaknesses. Please read each question carefully and then indicate the extent to which you agree or disagree by filling in the appropriate circle. "A" corresponds with "Strongly Agree"
"B" corresponds with "Agree"
"C" corresponds with "Undecided"
"D" corresponds with "Disagree"
"E" corresponds with "Strongly Disagree"
Please answer all items. Turn your completed questionnaire in to your principal.

* *

1. Field trips to the Forestry Institute are attractive to students mainly because it allows them to get out of the classroom.

2. The Resource person is an important factor in drawing my class to the Forestry Institute.

3. Pre-trip lessons are an essential part of the PREP program.

4. I participate in PREP because of the knowledge which my students gain.

5. I feel that I have a good understanding of what the PREP curriculum is trying to accomplish.

6. Students should have fun on the forest field trip.

7. It does not matter who the Resource person is as long as there is always someone available to help me.

8. The classroom follow-up activities are not important.

9. I would continue to participate in the PREP program if it was not required.

10. I am confused about the purpose of PREP.

11. The forest field trip motivates my students to learn more about forest management.

12. It is important for my students to relate to and be taught by someone other than their classroom teacher while on a field trip.

13. The pre and post trip activities take too much time to teach.

14. I participate in PREP because I believe it is important for students to learn about Canadian forest resources.

15. The main purpose of PREP is to develop academic skills.

16. Students are actively involved in learning activities during the majority of our time at the Forestry Institute.

17. Field trips are more effective when led directly by the Resource person.

18. Teaching pre and post trip lessons are a high priority for me.

19. I participate in PREP primarily due to my own interest in forestry and the outdoors.

20. I am unclear on what the main ideas of forest management are.

21. The PREP program is not effective without the field trip to the Forestry Institute.

22. The resource booklets meet my needs very well.

23. I would like to go to the Forestry Institute at a different time of year.

24. The main purpose of PREP is to increase public demand for good forest management.

25. The field trip motivates me to do a thorough job of teaching the pre-trip concepts.

26. I have to adapt many of the lessons and activities before I can use them with my class.

27. Teachers need training to use these materials effectively.

28. I feel there is good continuity between topics in different booklets and grade levels of PREP.

29. The success of the field trip is dependent on how well I prepare my students in the classroom.

30. The lessons and activities are easy for me as a teacher to present.

31. I am tired of teaching the same unit at the same time each year.

32. The presentation of ideas in PREP from beginning to end should be stated more clearly.

33. Field trips to the Forestry Institute are relaxing for me.

34. The activities outlined in the resource booklets are challenging to students.

35. I don't feel adequately prepared to do a good job of teaching about forest resources.

36. Learning outcomes in other curriculum areas are an important result of PREP involvement.

37. I dread field trip days to the Forestry Institute.

38. I think students would learn more if a greater variety of methods, media, and techniques were used in on-site presentations.

39. I think there are many good ideas for integrating forestry material with other subjects.

40. I feel a greater variety of programs should be offered for each grade level.

41. I feel that the PREP objectives are clearly stated.

42. More activities on forest management are needed which require students to use problem-solving, decision-making and critical thinking skills.

43. I would attend teacher workshops focused on ways to effectively teach and use the PREP program if they were offered.

44. The activities suggested in the resource booklets allow opportunities for students to be actively involved.

45. I would prefer using another site closer to school over going to the Forestry Institute.
    (Please identify other suggested site.) _____